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LONDON, AUGUST 5, 1955

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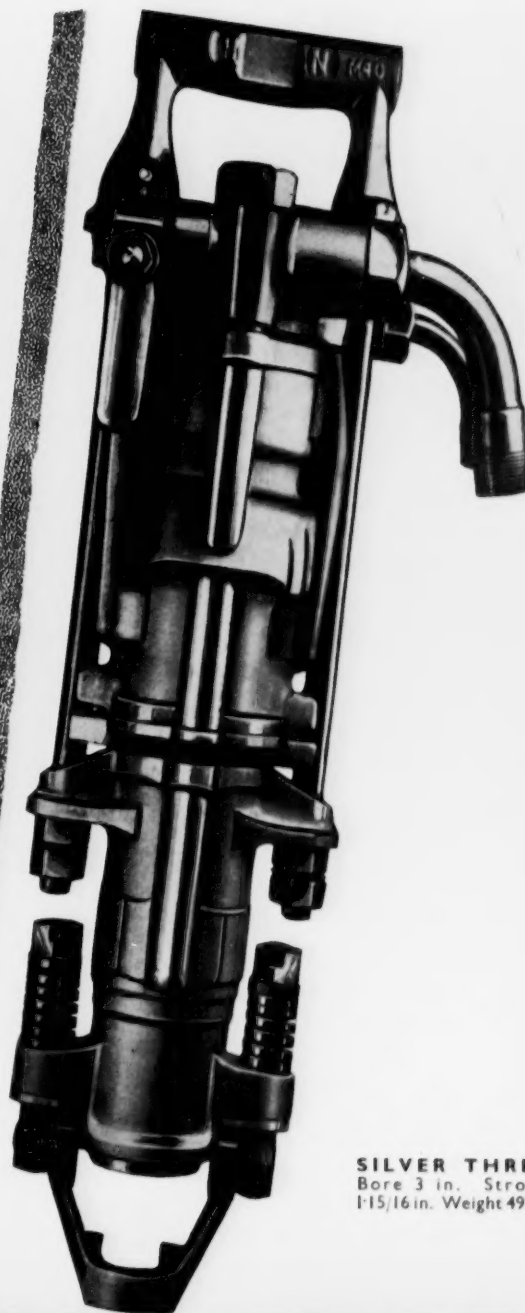
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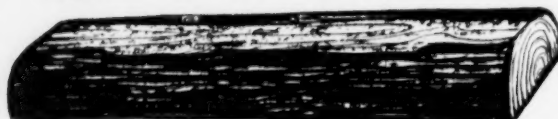
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NOTES AND COMMENTS

African Advancement on the Copperbelt

Following on the refusal of the Rhodesian Selection Trust group to give a guarantee that no measures of African advancement would be implemented on its mines without the agreement of the European Mineworkers (see *M.J.*, July 29, pp. 132), the Chamber of Mines subsequently gave the Union a formal rejection of this demand on behalf of both Copperbelt groups. Although it had been known for some time that Rhodesian Anglo American group were prepared to meet the Union on this point, the news over last weekend that this group had unilaterally signed an agreement with the European Mineworkers providing for the first steps towards African advancement has emphasized the extent to which current policy divergencies between the two groups have undermined the authority with which the Chamber is able to speak.

The agreement provides that 24 categories of jobs now held by Europeans on the Anglo American properties will be transferred to Africans as soon as administrative arrangements can be made and suitable Africans trained. European mineworkers, whose jobs go to Africans, will be given alternative employment under terms and conditions not less favourable than they might otherwise have expected to enjoy. The agreement is to operate for three years during which time an independent firm of industrial consultants will be retained jointly by Anglo American and the union, in order to examine the work content of all jobs performed by European mineworkers with regard to the responsibilities and skills involved. At the end of the period the union and the Anglo American companies will meet again to consider what further steps should be taken.

Precise information regarding the nature of these jobs is not available as we write, but it would appear that about half of them fall into the category of so-called ragged edge jobs (i.e. jobs which are already in some cases being done by Africans), while the remaining categories are mainly surface jobs. Preliminary estimates suggest that if the Anglo American agreement were extended to the whole Copperbelt, not more than 100 Europeans would be required to surrender their present jobs while, after fragmentation, these jobs might provide promotion for about 280 Africans. When compared with the 6,000 Europeans and 32,000 Africans employed on the Copperbelt, it will be apparent just how small is this initial step in African advancement. That this would, in fact, be so has, of course, been repeatedly stressed during the negotiations of the past two years.

The announcement of the Anglo American agreement has produced a sharp reaction from R.S.T. re-affirming the group's determination not to embark on any scheme for African advancement which would embody a "right of veto" by the European union, on the grounds that eventually "it would give the white unions control over the Federation's industrial, economic and racial future and would mean complete destruction of the partnership ideals."

We must confess to some little difficulty in following this argument. Whether "partnership ideals" are regarded as bi-partite as between white and black or tri-partite as between the companies, the European mineworkers and the African mineworkers, any concept of partnership implies the possibility of obstruction by one or other of the partners. It also implies equal rights to agree or disagree with a given course of action. All that the Anglo American agreement appears to have done is to guarantee partnership rights to the European mineworker. Since, as we pointed out last week, no progress can in practice be achieved on African advancement without the co-operation of the European mineworkers this guarantee appears to us to be no more than the recognition of a *fait accompli*.

The really important fact which emerges from the agreement is that a start has been made towards breaking the deadlock on the issue of African advancement. The first step has proved necessarily short and tentative but as Sir Ernest Oppenheimer observed over the weekend "once a measure of advancement has been achieved and it is demonstrated that the industry can accommodate such advancement without prejudicing the interests of any group of employees, then the future course of African advancement will become much smoother. Once the process has actually begun, much of the present rigidity will go out of the situation and it will tend to develop in a natural and healthy manner. In matters involving race relationships it is never a good thing to try to set precise targets and timetables. The best thing to do is to head out in the right direction and allow patience, goodwill and tolerance to play their part in shaping the future."

There is no gainsaying the fact that the European mineworkers have in the end adopted the long-sighted and statesmanlike view both of their responsibilities and of their own best interests, which sympathizers in this country have long hoped that they would. Perhaps the most significant commentary on the agreement may be found in South African reactions to it. According to the Johannesburg correspondent of *The Daily Telegraph* white mineworkers on the

Rand have no illusions about the ultimate meaning of the agreement. "Now," he writes, "the floodgates have been opened, if only an inch. Henceforth, at each reconsideration of the agreement nothing will stop their being opened a little more until no industrial colour bar in the copper mines is left."

It is also interesting to note that this correspondent regards R.S.T.'s disagreement over the so-called veto as reflecting only a divergence of view over immediate tactics, adding that the essential view of both Copperbelt groups is the same. This may well be near the mark and certainly it is devoutly to be hoped that some means may quickly be found of healing the most regrettable breach which is appearing between the policies of the two groups. It would be a tragedy if the triangular relationship on the Copperbelt were to degenerate into a quadrangular one.

Malaya's New Outlook

In last week's Federal elections in Malaya, the Alliance party scored a decisive victory. The election was as remarkable for its uneventfulness as it was for the overwhelming support given to Mr. Tengku Abdul Rahman's multi-racial Alliance Party which captured 51 out of 52 elected seats in the new Legislature. That the Alliance party is expected to assume office smoothly and without trouble reflects the widespread support for the sober realism of Mr. Rahman's political views and also pays tribute to the country's quiet determination to shoulder responsibility and to move forward towards their declared goal of independence.

A list of the party's financial and economic aims contains no radical measures. It seeks to cut down expenditure and achieve a balanced budget, to survey the existing import and export duties, and to encourage the establishment of new industries by amending the income tax laws. This latter objective will be carried out with a view to attracting local capital and to stimulate overseas investment in Malaya.

In so far as the tin mining industry is concerned the Alliance is pledged to agree a uniform policy on the alienation of mining lands, on the encouragement of capital investment in prospecting and mining, and on the improvement in the methods used in the mining and treatment of tin ore.

While there is nothing exceptional in these aims, their successful realization depends largely on what can be achieved to end terrorist activities which, in turn, would mean a considerable lessening of the heavy burden imposed by emergency expenditures.

At present, hopes of a balanced budget are brought closer by the near boom conditions in the rubber market and the higher price for tin prevailing which will reduce the Federation's deficit much below that which could have been looked for at the beginning of the year. But the new party cannot, of course, meet its future economic and financial problems on the assumption that these favourable conditions will continue.

Thus it is believed that an offer of amnesty to the terrorists at the "right time" coupled with the threat of an "all-out war" will end, or at the very least, render ineffective the long drawn-out guerilla struggle.

If successful, such a triumph would contribute hugely to the country's economic and financial stability as well as providing a sure basis for the flow of foreign capital into Malaya. Whether or not it would enable the Budget to be balanced is another matter. But the point seems almost insignificant besides the real benefits to be gained by the country once freed from the terrorist menace which has always prevented the fulfilment of any plans for the development of the country's natural resources.

Brazil

(From Our Own Correspondent)

Teresopolis, July 21.

Campanhia Brasileira de Alumínio inaugurated its aluminium plant at the company town of Aluminio, near Sorocaba, in June. Sorocaba is an important industrial centre, 75 km. from Sao Paulo, with good transportation facilities and power supplies. The new plant will process bauxite from the Pocos de Caldas deposits in Minas Geraes, where reserves are estimated to 150,000,000 tons of high-grade ore. This ore, however, is too friable for export.

The Company was formed in 1941 to carry out primary metallurgical treatments only. The project was abandoned, however, when the United States entered the war, and was replaced in 1948 by a more comprehensive scheme, which includes both extractive and mechanical metallurgical processes. The initial capacity of the new plant is 10,000 tons annually, but output will be raised to 50,000 as the demand increases. Consumption in Brazil is now approximately 12,000 tons.

The installations completed include an oxide factory, of 80 tons capacity, a plant for the manufacture of electrodes, a metallurgical plant of annual capacity of 10,000 tons equipped with 102 30,000 amp. Soderberg-Montecatini electric furnaces of capacity 200 kilos each, a foundry for all types of alloys, with sections for casting in sand and under pressure at capacities of 2.3 and 2 tons respectively per 8 hour-day, an extrusion mill for sections and tubes, one hot- and two cold-rolling mills—the extrusion and rolling mills have annual capacities of 10,000 tons—a paper lamination section of 3.4 tons daily capacity, a wire-drawing mill and electric cable factory, each of 5 tons per 8 hour day capacity, as well as sections devoted to the manufacture of aluminium goods, moulds, sulphuric acid and aluminium sulphate. The company is installing plant to produce synthetic cryolite, aluminium powder and vanadium oxide and is building a 40,000 h.p. hydro-electric station on the Juquia-Guacu River, to supplement the public supply.

MINERAL PRODUCTION

The 1934 Decree, which protected proprietors and fossickers and granted favours to companies exploiting deposits of gold and sub-products, has been extended for 20 years to encourage production. Brazilian mines produced 3,732 kilos of gold and 6,596 of silver last year, as compared with 3,604 and 6,592 kilos in 1953.

Although land-owners have preferential rights to exploit mineral deposits on their properties, any Brazilian or company organized in Brazil may obtain a concession to exploit idle deposits, whether on state or private lands. Prospecting for and exploitation of atomic energy minerals (uranium, thorium, lithium, boron, cadmium, beryllium, zirconium, rare earths and graphite) are subject to special legislation.

Brazilian mineral production continues to be concentrated in the east. In 1953 Minas Geraes accounted for approximately 50 per cent of the total value of output, estimated at 1,840,000,000 cruzeiros. This state is practically the only producer of gold, arsenic and graphite, and is by far the largest supplier of bauxite, iron and manganese ores, mica, rock crystal, zirconium, etc. Bahia, the only other important mining state in the east, exploits columbite, quartz, amianthus, beryllium and chromium ores.

Lack of transportation facilities in many regions has hitherto impeded development of known deposits, but this disability is being gradually removed.

Open-cast Mining of the Future

Mr. J. D. Reilly, vice-president of The Hanna Coal Division of Pittsburgh Consolidated Coal Company, United States, in the following article discusses the developments likely to take place in open-cast mining in the years ahead. Generally speaking, observations have been based on current research and experimental operations, and while the author's remarks are directed primarily towards coal winning they nevertheless lose none of their interest when applied to quarrying or open cut metalliferous mining. The article is condensed from a paper of the same title presented at the Centenary Congress of the Société de l'Industrie Minérale, held in Paris during June, 1955.

As there is a very limited amount of coal to be mined by the lower-cost open-cast method of mining, the prime objective is to move larger volumes of rock at a lower cost and go to a higher ratio of rock to coal.

At the present time, blasting is accomplished with a liquid oxygen explosive but the use of an ammonium nitrate explosive which would be mixed with aluminium dust and RDX, the outstanding explosive developed in World War II, is being considered. By the mixture of RDX, it would be possible to control the speed of the explosive.

It is hoped that, in the future, instead of drilling a 9-in. hole, it will be possible to drill a borehole 2 in. in dia. and use some of the great potential power that is in atomic energy or hydrogen to give fragmentation far beyond what can be accomplished by present methods. This would truly be a progressive step into the future since it would be providing beneficial and constructive uses of some of the extraordinary scientific developments which have come about in the work with nuclear fission.

USE OF PLASTIC CONTAINERS

An interesting coming development in the blasting field is the use of plastic containers. These containers can be sized to the nominal drill hole dia., then they can be packed into the hole in such a way as to allow the plastic container to expand, thus filling the irregularities in the hole and eliminating the cushioning effect of voids. The plastic bags would also have the advantage of being moisture-proof so that the loaded cartridges could be stored for considerable periods of time without losing their explosive strength, and they would be unaffected by wet overburden conditions. Common practice would be to follow immediately behind the blast hole drill with the charging crew and charge a considerable number of holes and then detonate them altogether, or detonate them in sequence by the use of delay caps.

ECONOMICAL DRILLING METHODS

The revolution in vertical drilling with rotary drills in open-cast mining is in its infancy. Within a period of two years it has been possible, by the use of these drills, to increase the drilling of 9-in. dia. holes from 300 ft. to 1,200 ft. in a 7½ hour shift. The manufacturers and engineers and all who are experimenting with this type of work believe that in the future as much as 1,500 to 2,000 ft. of bore hole to be drilled per shift may be expected.

The effect of more economical drilling methods and lower cost explosives will open up new possibilities in the field of overburden removal. The capacity of existing stripping units could be increased by improved fragmentation and displacement of the overburden by blasting. The thickness of overburden that can be economically handled would also be increased, thus expanding the field for larger stripping equipment. More efficient blasting and drilling would also minimize the disadvantages of hard rock in the overburden.

During the past year, the company started production on a super shovel which will go into operation late this year. This shovel will weigh more than 5,200,000 lb. and will be

equipped with a 60-cu. yd. dipper. This machine will be capable of stripping to 100 ft. of overburden. It is designed with greatly increased h.p. on all motions so that its speed and digging ability will be in a different category from all previous machines. The main motors are rated at 4,650 h.p. The shovel will be placed in service in Ohio and be used to strip coal in pits where the overburden thickness has exceeded the range of existing machines. It is believed that with the exception of ships, this huge unit will be the largest individual machine of any kind ever built by man.

This shovel, designated the Type 5760, will have a dipper capacity of 50-60 cu. yd., boom length of 150 ft. and a boom point height of 145 ft. Each crawler will be 8 ft. in height and 23 ft. in length. The cab deck, measuring 45 ft. by 63 ft. in area will be 24 ft. from the ground. In so far as actual operating facilities are concerned, the unit will have a maximum dumping height of 97 ft. and a maximum dumping radius of 140 ft.

REDUCED COST OF TRANSPORTATION

The third important item in the mine of the future should be the reduction of the cost of transporting coal from the pits to the washery. In this it is very fortunate that at the present time we have been able to develop low-cost highways in our mines, 40 ft. in width, that support the weight of trucks with a capacity from 75 to 100 tons. The efficiency of the present 55 ton trucks has been so rewarding, that it is hoped that in 1955 the studies of engineers and manufacturers will be far enough advanced to recommend the construction of a truck that would allow for the transportation of 100 tons of coal per trip. This would be designed in such a manner that the driver could steer and operate it from either end of the truck, eliminating the necessity of turning around under the loading shovels. We are examining the possibilities of having four separate motors, one for each set of wheels, for the motive power of this unit.

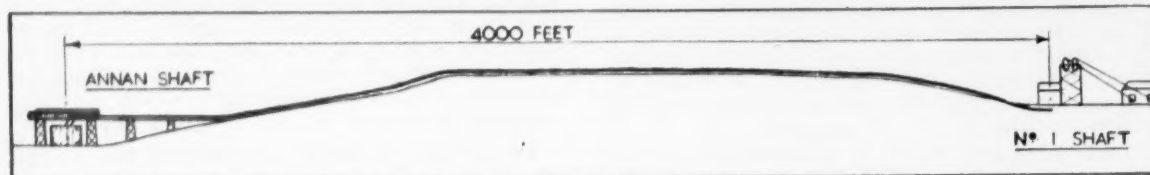
A further step would be to lower the transportation cost from mines to the consumer. In the United States it is usually possible to mine or produce the coal at a cost considerably less than is the cost of transporting or moving that coal from the mine to the consumer. We are working diligently to be able to transport coal through pipelines approximately 120 miles from the mine direct to one of our power plant customers. If this venture proves to be as successful as preliminary tests indicate, it is felt that the savings in transportation cost would assure coal a stronger position in the battle for fuel markets in the United States than it has at present and it would recapture some of the markets which have been lost to natural gas and oil in the past few years.

Last but not least, this mine of the future, by the use of electronic business machines, should give us sufficient data so that we would know to a small fraction of a decimal what the costs are in every phase of this operation, thus giving us control of cost and operation never achieved. Finally, a more emotionally balanced organization in developing the understanding of psychological problems of the personnel who operate the mine must be developed.

The Cable Belt Conveyor at Doornfontein

By P. HUNTER GORDON

On July 23, 1951, the first cable belt conveyor was installed at the Frances Surface Mine, Dysart, Fife, to carry the entire coal output up the surface drift 787 yd. long and with a lift of 572 ft. On August 17, 1951, a description of this installation and of the cable belt conveyor generally by Mr. Charles Thomson, the inventor, was published in *Iron and Coal Trades Review* and was read by the consulting mechanical and electrical engineers department of the New Consolidated Gold Fields Ltd. in Johannesburg. This chain of events resulted in a 1,300 yd. long cable belt conveyor, the first to be erected outside Great Britain, being installed and started up in February, 1955, at Doornfontein G.M. in the West Witwatersrand Area of the Transvaal, one of the New Consolidated Gold Fields Group. The following article by a director of Cable Belt Ltd. describes the cable belt conveyor installation at Doornfontein. Acknowledgements are due to the New Consolidated Gold Fields Ltd. and Cable Belt Ltd., for permission to publish the article and to Hubert Davies and Co. Ltd., Cable Belt Ltd.'s agents in South Africa and the Rhodesias.



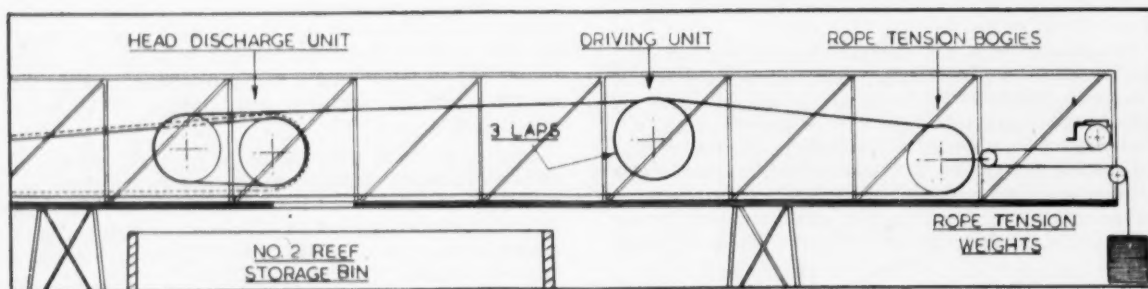
Profile sketch at a vertical scale of twice the horizontal scale, showing the route followed by the Doornfontein cable belt conveyor.

In the early planning stages of the scheme, New Consolidated Gold Fields advised Cable Belt Ltd. that they would prefer to deal on a contract of this size through a local firm. At this date Cable Belt Ltd. had just negotiated a licence for the United States of America with Messrs. Hewitt-Robins Incorporated of America and it was agreed that their subsidiary company, Robins Conveyors (South Africa) Ltd., should act on behalf of Cable Belt Ltd. for this contract. Subsequent negotiations with the New Consolidated Gold Fields in South Africa were carried out by Cable Belt Ltd. through Robins Conveyors (South Africa) Ltd., who were also responsible for the manufacture in South Africa of the mechanical parts of the conveyor to Cable Belt Ltd.'s basic designs, approved and altered where necessary to South African mining standards by New Consolidated Gold Fields Consulting Mechanical and Electrical Engineer's Department.

Gold ore is normally carried from shafts, which are situated at any great distance from reduction plants, by intermine railway, and the fact that the conventional belt conveyor is limited in length of a single flight has, in many instances, eliminated the use of conveyors for this purpose. The Consulting Engineering Department of the New Consolidated Gold Fields, however, immediately realized the potentialities of this new rope driven belt conveyor which can carry material in a single flight for distances of up to 12 miles. They decided to try it out at the Doornfontein Mine to carry 320 s.tons of gold ore per hour from No. 1 Shaft to the reduction plant at the Annan Shaft, giving the conveyor a centre distance of 4,000 ft. with a net drop of 39 ft.

The 30-in. heavy duty belt is supported by two $\frac{7}{8}$ -in. dia. ropes which are driven at 200 f.p.m. by two surge wheels. These are connected together through a differential gear and driven by a 60 h.p. electric motor through a reduction gear and worm drive. In practice the conveyor has proved itself completely capable of dealing with the output required.

One departure from standard cable belt layout was made for the first time in the particular installation at Doornfontein. Rope tension was arranged to operate forward of the driving gear. This explains the long gantry structure existing over No. 2 reef storage bin at the Annan Shaft and was done because there was not sufficient room in the conveyor tunnel at No. 1 Shaft between the loading-on point and the reef bin foundations to allow for the normal rope tensioning at the tail-end of the conveyor. This introduced an unforeseen feature when the conveyor was started up in that there was a release of tension on the bottom rope at the head end and the rope tension pulleys behind the driving gear actuated by the floating weights moved back. As a result, on starting up, the belt was carried in by the top run of rope at a certain speed while momentarily the bottom run of rope carrying the belt away was either moving more slowly or was stationary, and a loop of belt was thrown up on the head drum. This was rapidly overcome by the Mine Engineers who anchored the rope tension pulleys. As the ropes stretched, the rope tension pulleys were adjusted manually so that there was approximately equivalent tension in both ropes and a scheme was then worked out to connect the two rope pulleys together through a common pulley tensioned by a fixed tension, which would allow the



Diagrammatic explanation of arrangement of rope tension to operate forward of the driving gear.



Gantry structure over No. 2 reef storage bin, Annan Shaft.

two ropes to stretch independently while having a common tension.

A compressed air pipeline caused a dislodgment of the belt due to the fines being carried round in the early stages before adequate belt cleaning arrangements had been devised. These fines dropped on top of the pipe and built up and eventually dislodged the bottom belt from the ropes. Part of the reef material is extremely friable and at this stage of development there is also a good deal of water in the shaft so that part of the ore arrives on the belt as a slurry. The fine ore and the water tend to separate on the belt and considerable ingenuity was shown by the mines engineers in removing the resulting caked fines at the discharge end. A scraper of untangled wire rope on edge removed the heavy material. This is followed by a series of lawn mower scrapers, each set closer to the belt, the last one being adapted for clearing the belt sufficiently so a set of finger scrapers of spring steel was enough for final cleaning.

The conveyor is illustrated leaving the tunnel at No. 1 Shaft below the crusher house. The ore is hoisted by skip winder to the reef bin, at the bottom of which is an apron feeder. This carries the material up to a grizzly from which the fines drop straight onto the cable belt and the remainder goes to the jaw crusher which crushes the material to -6 in. before it is fed onto the conveyor by chute. Mining engineers unfamiliar with South African or gold conditions will have difficulty in realizing the ingenuity shown in the arrangement of trays which collect any drippings from the apron feeder or the grizzly that are washed down into a common sump and eventually pumped to the reduction plant for the recovery of gold. Any timber coming up in the skips thereby becoming impregnated by fines is picked out by hand from the plate feeder, collected, incinerated at a later date and the gold recovered.



Conveyor travelling up gantry to discharge, Annan Shaft.



Run of conveyor from Annan Shaft to No. 1 Shaft.



The conveyor leaving the tunnel at No. 1 Shaft.



The conveyor looking from the top of the hill towards the Annan and No. 1 Shafts. The concrete foundations can be seen as well as the structural steel and sheet metal housing adapted to protect the conveyor against wind and weather.



URANIUM—I.

Uranium as an Atomic Mineral

Uranium 235 is found in small proportions in natural uranium, which contains one part of this material to 140 parts U238. Neither plutonium 239 nor uranium 233 exists in the natural state, but they can be produced in atomic piles or reactors. When introduced under certain conditions in the reactor these nuclear fuels split up and inaugurate a controllable chain reaction. The same reaction takes place in an atomic explosion but is, of course, uncontrollable. The following article discusses uranium in its function of atomic mineral and concludes by discussing certain economic factors of the procedure. A concluding instalment will enlarge on these economic aspects.

The fission of any material is accomplished by an enormous release of recoverable heat and some nuclear reactors are designed in such a way as also to produce a fissionable material from so-called "fertile" substances, such as uranium 238 or thorium, which are placed in contact with the nuclear fuel. In reactors of this type, which are known as breeders, the amount of fissionable material thus produced can exceed the amount of nuclear fuel used. In other words, advantage can be taken of all the natural uranium and thorium, both of which consist mainly of inert isotopes. This can only be done progressively, as and when it is possible to imprison these inert isotopes in the reactor.

In Britain's experimental fast neutron breeder reactor, Zephyr, there are no cadmium or boron steel rods to control the reaction rate. Instead, parts of the uranium blanket surrounding the plutonium core are made moveable. Since this uranium blanket not only captures a few of the neutron particles escaping from the core to form plutonium, but also reflects back into the core the considerably greater number of neutrons which are not captured, the removal of part of this blanket from the proximity of the core reduces the number of neutron particles returned to the core to carry on the reaction.² The emergency shut-down mechanism that will stop all reaction depends on the same quality of the uranium blanket.

A number of processes for purifying the spent fuel in fast breeder reactors of this type have been developed. They enable the plutonium or uranium 233 or 235 fuel to be kept in metallic form and are therefore relatively cheap to operate.

RADIOACTIVE ISOTOPES

A radioactive isotope is a form of an element which differs only in weight and atomic structure from the element in its usual form. This change makes possible the release of useful energy.

When materials are placed inside a reactor they, too, are "hotted up." Thus ordinary metallic cobalt picks up some neutrons to come out as radioactive cobalt 60. Iridium metal comes out as iridium 192, common salt as sodium 24, thallium as thallium 204. These materials continue to give off energy in the form of beta or gamma radiation. If a reactor can be regarded as an atomic furnace, the fission product might be described as a radioactive ash.¹ From this ash a variety of materials can be recovered for industrial use: e.g., strontium 90, caesium 137, ruthenium 106 and cerium 144. The uses of radioactive isotopes in mineral dressing have been reviewed in *The Mining Journal*.³ Spectacular progress has since been made in the utilization of materials which have been made radioactive.

Three widely different applications in the radioactive tracer laboratories of D.S.I.R. research stations and industrial research associations should be sufficient to illustrate the remarkable versatility of isotope techniques for purposes of research. The National Physical laboratory is now applying tracer methods to metallurgical problems. It is

hoped, for example, that tracers will assist in determining the precise concentrations of dissolved elements at grain boundaries, how they vary with heat-treatment, and how the dissolved atoms move from the grain interior to the boundary.

The Hydraulics Research Station recently collaborated with the Atomic Energy Research Establishment, Harwell, and the Port of London Authority in carrying out a pilot experiment which demonstrated the suitability of a tracer technique for indicating the movements of mud in the Thames Estuary. The British Coal Utilization Research Association is finding tracer methods of value in studying the release of sulphur during combustion.

INDUSTRIAL REQUIREMENTS

The industrial requirements of radio isotopes now exceed those of research departments. Dr. Henry Seligman, head of the isotope department of Harwell, recently stated that there were at present 150 to 200 thickness gauges in use in Britain, which measured thickness by the amount of radiation absorbed by a material passing between a radio isotope source and a geiger counter. The number should increase within the next two or three years to several thousands. The use of radioactive sources to eliminate static electricity is also increasing very rapidly. So, too, is the use of isotopes for industrial radiography; e.g., in examining welds in pipes in places where electricity is not readily available.

Research and development work is being undertaken by commercial firms on improvement of the physical properties of plastics such as polythene, nylon and silicone rubbers which can be vulcanized by irradiation without the use of vulcanizing agents). Irradiated polystyrene can carry up to 100 times its own weight after irradiation and also has improved heat resistance. Cables insulated with irradiated polythene (which normally would melt at 70 deg. C.) can be used at temperatures up to 200 and 300 deg. C.

In 1953 Britain's production of radioactive isotopes reached a value of £400,000, about one-third of the output being exported. Last year more than 5,000 shipments were made, including a number to the U.S., and this year shipments are expected to exceed 7,000. It has been stated that in 1954 more radioactive isotopes were exported from the A.E.R.E. at Harwell and its out-station, the Radio-chemical centre at Amersham, both in terms of numbers of consignments and in terms of value, than were exported by all other producing countries combined.

In the United States the first nuclear reactor specifically designed for private industrial research is to be located at the Armour Research Foundation of the Illinois Institute of Technology, Chicago, Illinois. It will use fissionable material obtained from the U.S. Atomic Energy Commission. This reactor is not intended for the generation of electrical power, but will provide neutrons and gamma radiation for research in many fields. Short-lived radio-isotopes will be available locally from this new source.

The large-scale use of nuclear fission for generating power was predicted 12 years ago as soon as the first pile

or reactor was built. Nevertheless the fact that the U.S. Atomic Energy Commission is engaged on a programme of nuclear development costing \$200,000,000 over a five-year period, and that Britain plans to spend £300,000,000 in the next ten years is an indication that economic nuclear power will not be achieved without a tremendous effort of technical research.

In the United States the policy of the A.E.C. is to examine a number of types of reactor very carefully to make sure that the most economic designs are selected for commercial use. In the five-year programme five different types of reactor are being developed on an experimental scale or larger. Other types, such as a liquid metal fuel reactor, are in earlier stages.

There are at present three plants actually under construction in the U.S. A pressurized-water reactor having a production capacity of 60,000 kW. of electricity is being built by Westinghouse and the Duquesne Light Company near Pittsburgh. At Los Angeles, (California, the North American Aviation Company are building a reactor from which heat will be withdrawn by means of liquid sodium metal, as in the power unit installed in the atomic submarine "Nautilus." The third reactor is an experimental unit being built at the Argonne Laboratory, in which steam will be drawn off directly from within the reactor core in order to drive a turbine.

Britain's first nuclear power plant at Calder Hall, Lancashire, is expected to be in operation early next year. Work has also started at Dounreay, in Scotland, on the construction of the first large power-breeder reactor. In addition, two new experimental piles are being built at Harwell, one being "Zephyr," the experimental breeder reactor previously mentioned, and the other a heavy water moderated reactor which is now in an advanced stage of construction.

U.K. PROGRAMME

The White Paper of February 15, 1955, set out Britain's programme for the next ten years. It is planned to devote £300,000,000 to the construction of twelve electrical power stations with a total capacity of 12,000,000,000 kWh. by 1965; i.e. the equivalent of 5,000,000 to 6,000,000 tons of coal. This plan represents only a start in the programme of nuclear power development.

It was recently announced in Parliament that to ease the drain on coal and at the same time to speed up nuclear defences, the Government had placed orders for three further atomic stations at an additional cost of £60,000,000. These will follow the pattern of the station under construction at Calder Hall. Their first purpose will be to produce plutonium, but they will also produce a useful contribution to the electricity of the grid in the lifetime of the present Parliament. One of the new stations will be put up at Calder Hall and the others will be situated near Winscale, Cumberland. Each factory will have two reactors. At present there is only one factory producing plutonium, this being situated at Sellafield, Cumberland. There is also a plant at Capenhurst, Cheshire, for separating refined from natural uranium for military use. The three new power stations will make separation of plutonium a much cheaper process than before.

Some experts believe that, by 1975, no more coal-fired power stations will be built in the United Kingdom. It has also been predicted that by 1975 a substantial proportion of the power used in the United States will be generated in nuclear power stations.

The construction of reactors and nuclear power stations will not, of course, be confined to Britain and the United States. The Canadian Trade Minister, Mr. C. D. Howe, announced recently that the Federal Government would

contribute between \$7,000,000 and \$8,000,000 towards the construction of Canada's first atomic power plant. This experimental plant, which is expected to cost between \$13,000,000 and \$15,000,000 will be built at the site of the Ontario Hydroelectric Power Commission's plant on the Ottawa River.

The Atomic Energy Commission of India has drawn up a plan for the development of atomic energy during the next four years. The Prime Minister, Mr. Nehru, has stated that India will have her first experimental reactor this year or early next year and a second and larger one by the end of 1956. Plans are under consideration for the production of heavy water, which for the time being will be purchased from the U.S.

Finally, it may be anticipated that important developments will result from President Eisenhower's recent offer of assistance to all free nations to develop atomic energy for the benefit of their people. The President undertook to ask Congress to pay half the cost of providing atomic reactors for research and to furnish the material needed to fuel them. Training would also be provided.

LITHIUM — PRIME FUEL SOURCE

When atomic power first came within the realm of practical possibility, the attention of the British Electricity Authority was directed to the design of generating stations operating on conventional steam cycles, but deriving their energy from nuclear reactors. A special group has now been formed at the Atomic Energy Research Establishment to study new methods by which nuclear energy might be harnessed without using it to produce electricity. In the foreseeable future the fusion process could render obsolete to-day's uranium-fuel reactors. Relatively cheap lithium would then become the prime source of atomic fuel.

Meanwhile the economics of atomic power generation appear to have been radically altered by the development of breeder reactors, which provide a more efficient means of using uranium and other nuclear fuels. Improved methods have also been developed for disposing of the large quantities of radioactive waste materials which will be produced as a result of the atomic power programme.

At present radioactive sludge from the effluent water and other liquids used at Harwell is placed in steel drums and shipped out to sea. The same is being done with contaminated metals and equipment used at Harwell, following failure to gain permission to bury them in the coal mines of the Forest of Dean. The new process, which has been running on a laboratory scale, depends on the reduction of waste products by special heat treatment into a calcined form in which they will not be soluble in water. The treated materials will then be placed in radiation tanks or barrels, so built that they cannot corrode until the radioactivity of their contents has died away. As a result of this process, the actual physical quantity of waste products stored will be reduced to a very small amount indeed.

Less than two years ago Sir John Cockcroft, Director of the Atomic Energy Research Establishment, gave some tentative figures based on a hypothetical fission nuclear power station developing 50,000 MW of power. He concluded that the annual fuel costs would lie between upper and lower limits of £450,000 and £150,000, which would compare with a coal cost of £730,000 a year for a British Electricity Authority station of similar capacity. It was further assumed that the first nuclear power stations would be of double the capital cost of a conventional power station.

REFERENCES

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The Melting, Refining and Granulation of Cobalt Powder

The increased need for cobalt in high-temperature alloys and permanent magnets has stimulated interest in new metallurgical methods of extracting cobalt from its ores. In the spring of 1953 a series of tests were made in the United States to develop a method suitable for melting, refining and granulating cobalt powder produced by the Calera Mining Co. These tests are described in the following article, condensed from *Report of Investigations 5133* by T. D. Marchant, L. H. Banning and W. F. Hergert, metallurgists in the United States Bureau of Mines. The report is published by the Bureau.

The Branch of Pyrometallurgy of the Northwest Electrodevelopment Experiment Station, United States, is equipped with several different types of electric-arc furnaces. A standard, 3-phase, size ST, Pittsburgh Lectromelt electric-arc furnace was used to melt, refine, and granulate the Calera Mining Co. cobalt power. The furnace was equipped with three 4-in., automatically controlled graphite electrodes, and the power was furnished by a 4-tap, 1,200 kVA. transformer. Voltages on open circuit of the various transformer taps were: tap 1, 199 volts; tap 2, 147 volts; tap 3, 115 volts; and tap 4, 85 volts. The furnace shell had a charging door at the rear of the furnace and a pouring spout in the front. The hearth of the furnace was rammed magnesite over magnesite brick. A monolithic firebrick roof was used at the beginning and end of the campaign; during the campaign 86 heats were made using a silica roof.

OPERATIONAL EQUIPMENT

To avoid contaminating the cobalt with iron, wooden rabbles were used to remove the slag into cast-iron slag ladles. When the melted, refined, and deoxidized cobalt metal was ready for removal from the furnace, it was poured into a tank of water directly below the pouring spout of the furnace. The quenching tank was 64 in. in dia. and 9 ft. in depth. Cold water entered the tank through a 2-in. pipe near the bottom. Warm water overflowed an 8-in. weir of adjustable height near the tank top. The overflow passed into a sump tank and was pumped to waste by a centrifugal pump. The sump tank and pump were installed below the floor level.

A small concrete mixer heated by a gas torch was used to dry the cobalt granules after they were lifted from the tank. The dried granules were screened on a 6-mesh vibrating screen. The granules exceeding 2 in. in dia. were handpicked during screening; the -2-in., +6-mesh granules were packed in wooden kegs for shipment. Over-size and undersized granules were returned to the furnace charge as scrap.

The refining slags were crushed in jaw and gyratory crushers. Crushed slag was passed over a magnetic separator to remove any cobalt prills. The prills were then returned as part of the scrap, which was charged back into the furnace.

Four truck loads of cobalt powder were received from the Calera Mining Co. The powder was packed in paper-lined wooden kegs, each containing about 400 lb. The total weight of powder was 107,972 lb. There was little noticeable variation in composition of the cobalt powder, shown in composition (per cent) in the following table:

Sample	Co + Ni	S	P
A	99.10	0.066	0.067
B	98.92	.038	.072
C	98.79	.047	.094

In time, the following satisfactory procedure for melting a charge of cobalt powder was established. Immediately after a pour was completed, the furnace was returned to its operating position and a new charge was shovelled onto the hearth. The charge consisted of about 800 lb. of cobalt

powder plus 50 to 90 lb. cobalt scrap. The cobalt scrap included +2-in. granules, -6-mesh granules, and metallic prills extracted from the refining slag. A cover of approximately 40 lb. of burnt lime was charged directly on top of the powder. Electrical energy was then applied to the furnace using a transformer setting of 115 volts at a power input of 140 kW. To avoid damage to furnace refractories, about 15 min. after starting the length of the electric arcs was shortened by changing the transformer setting to 85 volts and decreasing the power input to 100 kW. A normal heat required about 18 kWh. of electricity for complete melt.

REFINING PRACTICE

In refining to G.S.A. requirements, it was necessary to remove both sulphur and phosphorus from the cobalt powder to meet stockpile specifications. The usual practice for removing sulphur from a metal bath is to flux it with a high-lime slag while maintaining reducing conditions in the furnace. The practice to remove phosphorus is to use a high-lime slag while maintaining oxidizing conditions in the furnace. Two slags were used in each of the first four heats. The slags were composed of a mixture of lime, silica, and fluorspar. When it became fluid the slag was removed by raking with wooden rabbles. Additional lime, and in some cases fluorspar and silica were shovelled over the molten bath to form the second slag. When the slag was fluid it was raked off. Analyses of products showed that the first slag removed both sulphur and phosphorus from the molten cobalt.

Aluminum exclusively was employed for deoxidation, and about 4 lb. was used per heat. Three to five minutes after aluminum shot was added to the molten bath, a sample was dipped and poured into a small sample mould. If there was evidence of gas evolution, molten metal extruded from the centre of the sample and aluminum was then added to the molten bath until the sample showed shrinkage upon freezing and cooling.

The metal bath had to be at high enough temperature, usually above 1,600 deg. C., so that it did not freeze in the furnace tap hole when pouring. From six to ten minutes was the time normally required for pouring a heat. When the temperature dropped below 1,500 deg. C. during pouring there was danger of the metal freezing and interrupting operations. The temperature of the water in the quench tank gained from 10 deg. to 20 deg. C. in granulation.

Three types of granules were made during the campaign. They were arbitrarily designated as nugget, flaky, and shell types. The first two were the most common and the last was very rare. The hollow-shell type was produced from a heat not deoxidized completely. Special precautions kept this type of granule at a minimum.

It was concluded that the cost of melting, refining, and granulating cobalt powder depends directly on the time required for the operation. Melting takes up the largest proportion of the time required for completing a heat. Results indicated that the cobalt was refined when the metal was hot enough for skimming off the refining slag, deoxidizing, and pouring.

The Geneva Atom Conference

On December 4, 1954, following proposals laid before them by President Eisenhower, the United Nations unanimously resolved to hold a conference on the Peaceful Uses of Atomic Energy. The conference resulting from that proposal will be held at Geneva during the period August 8-20.

The subjects to be discussed include nuclear energy in relation to World power requirements, the construction of reactors, the use of radio-isotopes in industry and the health and safety of those engaged in these new enterprises. The conference will be held at the Palais des Nations and invitations to send delegates were extended to 84 countries including all the major powers.

The President of the Conference will be Dr. Homi Jehangir Bhabha F.R.S., Director of the Tata Institute of Fundamental Research, Bombay, and Secretary of the Indian Atomic Energy Commission. The secretary-general of the conference, Professor W. G. Whitman, of the Massachusetts Institute of Technology, will serve as an officer of the United Nations Secretariat assisted by a working party headed by Mr. Ralph Bunche, Mr. Ilya Tchernysher and Dr. Gunnar Randers, of the United Nations. Professor Whitman's deputy will be Dr. Victor Vavilov, of the Academy of Sciences, Moscow.

The British delegation, headed by Sir John Cockroft, will include Sir Christopher Hinton, Managing Director of the U.K.A.E.R.E. Industrial Group, Dr. J. F. Loutit, of the Medical Research Council and Agricultural Research Council, Sir George Thompson, Royal Society, representing British Universities, and Dr. Willis Jackson, of Metropolitan-Vickers representing British Industry. The total delegation including advisers and staff will total more than 160 persons.

Besides the official delegates of the member nations the conference, which is an open one, will be attended by representatives of companies intimately concerned with the manufacture of atomic energy plant. From the United Kingdom delegates of companies such as A.E.I., English Electric, Head Wrightson Processes, Babcock and Wilcox and the aircraft industry will be partaking in the discussions.

In all, something of the order of 1,000 papers will be presented or published. Much of the secrecy at present associated with atomic energy is expected to be disposed of at this conference. In particular the Russians are to present papers dealing with the thermal conductivity of molten metals and the processing of thorium, which will indicate the progress she has made in developing fast breeder power reactors. Several other "Iron Curtain" countries are presenting papers and the potential benefits of atomic power countries such as China, which has large monazite resources and Czechoslovakia with its Joachimstad uranium mines will be discussed. In the mining world much interest will be attached to Russian papers on aerial prospecting methods for radio-active minerals and the processing of uranium ore.

Two exhibitions are being held in conjunction with the conference at which the major powers will compete in demonstrating their advances in the atomic energy field. Britain in taking 30,000 sq. ft. of exhibition space becomes the largest exhibitor, the Atomic Energy Authority display including seven models of reactors.

British firms exhibiting include companies such as English Electric and Babcock and Wilcox concerned in the heavy engineering branch of atomic power station construction, Taylor Woodrow, who were responsible for the civil engineering work on the Calder Hall station, and Elliott Bros., who are prominent in the nuclear instrumentation field.

The Consolidated Zinc Corporation which has taken 180 sq. ft. of exhibition space is featuring its production of fluorine chemicals at Avonmouth. These include fluorocarbons, boron trifluoride which finds application in Geiger counters and anhydrous hydrofluoric acid which is used for the manufacture of uranium hexafluoride, a vital phase in the extraction of pure uranium metal. Of interest to the mining man is a section of this stand demonstrating Australia as a source of radioactive minerals. Rum Jungle, which is managed by a company of the Consolidated Zinc Group, is featured and mention is made of other occurrences in Australia both of uranium and thorium minerals.

TECHNICAL BRIEFS

Production of Crystals of Greater Variety

The Metals and Ceramics Research Department of the General Electric Research Laboratory, United States, has increased the number of materials from which it has been able to produce perfect crystals. New progress has been made in growing larger crystals and in the study of their revolutionary properties, according to a report in *American Metal Market*.

The materials from which these crystals have been made include, zinc sulphide, zinc, cadmium, copper, gold, silver, iron, nickel, cobalt and platinum. The size of the crystals is about the diameter of a horsehair and up to two inches in length.

Investigation of mechanical properties shows a tensile strength of at least 180,000 p.s.i. on a copper crystal, or roughly six times the strength of ordinary copper. This strength was measured in a tensile test; rather than by the bending method usually applied to these small crystals.

The work at G.E. Research and other laboratories is likely to lead the way towards obtaining greatly improved mechanical and electrical properties in metals and other materials. In time, they may have a revolutionary industrial influence. It is probable that in some cases, the "perfect" crystals have a strength of 100 times that of the ordinary metal.

The crystals generally have one dislocation along the crystal axis. This dislocation might be termed a linear imperfection in the arrangement of atoms in the crystal. The crystals are grown from the vapour state and take approximately half an hour to cultivate.

Diamonds as Electronic Valves

Recent research has shown that while most diamonds are insulators at room temperatures, certain types of diamonds behave as semi-conductors, or crystal valves, when the temperature is raised only slightly above room temperature.

Experiments carried out in the U.S. and South Africa have shown, for example, that these diamonds which belong to the group of diamonds II.b. containing the famous blue diamonds, can act as crystal valve rectifiers. Electrical contacts are provided by coating the diamond with a layer of silver one side and a point contact on the other side.

Experiments reported in the scientific journal *Nature* from the Diamond Research Laboratory, Johannesburg, showed that when a five-volt current was applied to a diamond of this type at a temperature of 200 degrees centigrade the current passing forward through the diamond was 100 microamperes, while no reverse current could be measured.

Other experiments with diamonds of this group have shown that currents of about 10 amps may be carried by some diamonds when a force of 125 volts is applied, although it is believed that currents as high as this may, perhaps, cause permanent changes in the diamond.

New Tube Cleaning Apparatus

A new method of cleaning the insides of tubes which will have a wide application and give considerable advantages in speed and efficiency is indicated by a report on maintenance work carried out recently at the Prince Regent Tar Company. The tubes involved in this particular job were still tubes used in the coal tar distillation process.

The new method reduced cleaning time from one day to 30 minutes. The apparatus was an adaption of British Oxygen's flame cleaning equipment. The still tubes in question were cast iron, 15 ft. in length and 2 in. bore, and a simpler burner was designed with integral fins. This fitted into the bore so that the whole length of the tube could be traversed internally.

The burner had only a few $\frac{1}{8}$ in. holes drilled into it for gas nozzles and these were sufficient to bring about the required conditions. The assembly was attached to an ordinary piece of lance tubing through which the gases were supplied and it was then possible to push the assembly through all the obstructions,

METALS, MINERALS AND ALLOYS

COPPER.—The continuing American copper crisis has been characterized during the past week on the one hand by slight progress towards strike settlements, together with a hardening of the Administration's attitude towards the Mine-Mill Union and on the other by an intensification of the copper famine and of the threat of constant shutdowns.

Of the three main producers still struck a week ago Kennecott, A.S. and R. and Phelps Dodge—only the last-named has since reached a settlement with Mine-Mill. The new contract provides for wage increases ranging from 11½ to 17½ c. an hour according to job category, together with a new health and welfare plan. Although it is hoped that this agreement may pave the way for early settlements at Kennecott and A.S. and R., there is still no sign of this as we go to press, and discussions are reported to have bogged down again over the Union's demands for bigger pension benefits.

Marketwise the U.S. copper position day by day becomes increasingly critical. Some 65,000 tons of U.S. production have now been lost since July 1, and even if the outstanding strikes are promptly settled further losses must be incurred before full production is resumed. The pipeline between mine, smelter and fabricator is rapidly emptying, and for the latter the really testing period will come in the next few weeks as the big users endeavour to come back into production after holiday shutdowns and before the pipeline has had time to refill. The Chase Brass and Copper Company, a Kennecott subsidiary, and Revere Copper and Brass, one of the leading independent fabricators, were forced to close down completely last week after, having been on short time, and other shutdowns seem inevitable. Whatever happens the effects of this strike seem certain to be felt well into the Autumn and the only immediately bright spot is that the automobile industry is beginning to cut down on production of its 1955 models, so there should be a temporary slackening in demand from that quarter.

While the U.S. producers controlled price still remains at 36 c., prices in excess of 50 c. are now being paid for immediate delivery of such foreign copper is available. This, of course, is well above current L.M.E. prices, yet a significant aspect of the present situation is that despite rising U.S. prices, stocks of refined copper in official L.M.E. warehouses continue to show steady improvement, a further rise of 688 tons being recorded last week to a total of 5,891 tons. These figures are not in themselves large, but it is most encouraging to see the London market beginning to acquire working tonnages and the fact that it is apparently able to do so in the face of the current American situation suggests that the mechanism of the Metal Exchange may be less defective than has been suggested in some quarters.

On Tuesday this week the R.S.T. fixed copper price was raised from £280 to £325 per ton. This price will remain in force for the next 30 days and will thereafter be subject to revision at a day's notice. It may be no more than a coincidence that this price approximates closely to a U.S. level of 40 c. which has, in some quarters, been forecast as the probable extent of an eventual further increase in the U.S. producers' controlled price. Owing to the fact that U.S. copper wage contracts are usually related to the prevailing level of copper prices, it seems extremely improbable that there will be any change in the U.S. producers' price until current wage negotiations are completed. When the increase does come, it will presumably be mainly in deference to the wishes of the Chilean Government which is understandably seeking an increase on the 35 c. it is at present receiving for Chile's contractual deliveries. On the other hand, it seems reasonable to assume that any such price increase would be linked to an undertaking by Chile to increase the tonnage of metal she is supplying to the U.S. at the higher controlled price. This might well, in due course, have the effect of diverting enough additional copper on to the U.S. market to bring the free price down to somewhere near the 40 c. level, at which point the way might then be open for a return to a one price basis for the metal.

LEAD AND ZINC.—The U.S. market in both these metals appears firm with producers' reporting that 80 to 85% of their August production both of lead and zinc has already been sold. The lead position is not surprising with A.S. and R. strike still unsettled. Incidentally, it appears that one of the obstacles in the way of agreement with Mine-Mill is the company's wish to get away from the copper price as a basis for discussion and to negotiate on the basis of settlements already reached in the lead-zinc industry which have averaged around 6 to 8 c. an hour. Understandably, the company insists that it must make this stand if it is to remain competitive with other lead producers.

As regards zinc, it is surprising that the impact of the copper shortage in the brass industry has not yet had a more marked effect on zinc buying. Presumably the continued strength of the galvanizing industry is a partial explanation, and beyond this, brass makers may well be developing a psychological reaction against low stock margins in the light of current experience with copper.

TIN.—In the table below we give the latest reported outputs from the chief producing countries. These figures tend to confirm our earlier impression that world production is unlikely to be much less than in 1954.

Country	Period	1955	1954
Belgian Congo	Jan.-June	7,623	4,894
Bolivia*	Jan.-May	10,654	10,127
Indonesia	Jan.-June	14,245	15,962
Malaya	Jan.-June	30,706	29,535
Thailand	Jan.-May	4,080	3,799
Nigeria	Jan.-May	3,282	3,246

* Exports

Of the main producers only Indonesia output is lagging markedly behind last year's figures, but this may well pick up before the end of the year. The key not only to better Indonesian production but also to that country's ratification of the I.T.A. lies the solution of the present political crisis. As matters now stand there appears to be some doubt as to whether the decision on ratification will even feature in next September's Parliamentary session in view of the Parliamentary elections due to be held on September 29.

ALUMINIUM.—Following a labour settlement at the beginning of this week with the C.I.O. United Steel Workers and A.F.L. Aluminium Workers' International Union providing for an average 15 c. hourly wage increase for some 26,000 workers, the Aluminium Company of America has increased prices of aluminium pig by 1 c. per lb. and aluminium ingots by 1.2 c. per lb., effective August 1. Prices for other grades of ingot, depending on the form and composition of the product have also been increased by 1.2 c. per lb. or more. The new and revised price schedules bring the base price for standard 99 per cent. aluminium pig to 22½ c. per lb. up from 21½ c. per lb. Standard 99 per cent plus aluminium ingot now is 24.4 c. per lb. against 23.2 c. per lb.

NICKEL.—A tentative wage agreement last week has averted a strike by 15,000 workers against the International Nickel Company of Canada. Although the terms of the settlement were not disclosed, it is known that 88 per cent of the International Union of Mine, Mill and Smelter Workers at Sudbury and Port Colborne voted in favour of a strike to support their reported demand for a ten cents per hour wage boost and pension benefits. Inco had been retiring workers at the age of 65 while the Union sought to have the retirement age reduced to 60 years or after 30 years of service, whichever occurred first.

TITANIUM.—Imperial Chemical Industries and Columbia-Southern Chemical Corporation, of Pittsburgh, U.S.A., have submitted a joint application to the United States Government for a contract under which the Government would undertake for a five-year period to purchase 5,000 s.tons per annum of granular titanium metal.

In their application to the Government for a contract the companies have stated that they have completed arrangements for the introduction into the United States of a granular titanium process not at present employed there and would also make available to fabricators techniques not at present known or employed in the United States.

If a contract is awarded in pursuance of their application, I.C.I. and Columbia-Southern Chemical Corporation will form a jointly-owned subsidiary for the purpose of producing granular titanium metal by I.C.I.'s sodium reduction process. The parent companies will each hold a 50% interest in the new company which would be known as the Columbia Titanium Company. The plant would be built at Natrium, West Virginia, and would have a capacity of 5,000 s.tons per annum. The cost of the proposed granular titanium metal plant will be in the region of U.S. Dollars 10,000,000.

Columbia-Southern and I.C.I. believe that their proposal will result in lower capital and production costs and in the acceleration of a titanium fabrication industry in the U.S.A.

The London Metal Market

(From Our Metal Exchange Correspondent)

With the holiday season now at its height the demand for lead, zinc and tin has diminished, but a firm undertone remains with purchases being made of metal for delivery during the next three months and beyond.

On Thursday morning the Eastern price for tin was equivalent to £764½ per ton c.i.f. Europe.

The copper market has once more been dominated by the American strike situation, which has resulted in a maintenance of the backwardation in spite of a further substantial increase of stocks in U.K. official warehouses, as shipments across the Atlantic remain possible when buyers in the U.S. will pay 49 c. per lb. and over for wirebars for September delivery.

The R.S.T. group have announced an alteration in their basis price from £280 per ton to £325 per ton, and it seems that if further drastic alterations have to be made from time to time the old argument will be revived on the merits of having small daily fluctuations rather than large ones at longer intervals.

The Committee of the Metal Exchange have published a form of c.i.f. contract for electrolytic copper wirebars (the text of which appears below) on which they have asked for the trade's comments. The accompanying statement points out that the desirability of giving buyers some options has outweighed the call for a form of contract which would give a price for promptly available metal.

It can readily be appreciated that, whereas the only method of attaining the second object would be to have a contract covering the delivery of a single weight of wirebar at one specific point which could have only a very limited domestic value, the proposed contract is capable of being extended for delivery at European ports, and the statement makes it clear that this is envisaged as soon as various financial hindrances have been removed.

Finally, no date for the contract's introduction is given, and it is obvious that the Committee will have to be certain that sufficient physical metal will be available and will be sold through the Exchange before a final decision on this point can be taken; it is probably assumed that, when the time comes, the premium for nearby metal will have largely disappeared, and therefore the quotation for specificable copper wirebars to be delivered within about 90 days will be acceptable to both producers and consumers as a basis for long-term contracts.

Closing prices and turnovers for four days to August 4 are given in the following table:—

	July 28		August 4	
	Buyers	Sellers	Buyers	Sellers
Copper				
Cash	£364	£364½	£368½	£369½
Three months	£357	£358	£361	£363
Settlement	£364½		£369½	
Week's turnover	4,475 tons		2,800 tons	
Tin				
Cash	£763	£764	£763	£764
Three months	£756	£757	£757½	£758
Settlement	£764		£764	
Week's turnover	620 tons		385 tons	
Lead				
Current half month	£107½	£107½	£107½	£108
Three months	£107	£107½	£107½	£107½
Week's turnover	2,850 tons		1,400 tons	
Zinc				
Current half month	£89	£89½	£90½	£90½
Three months	£90½	£90½	£90½	£91
Week's turnover	3,725 tons		2,775 tons	

Draft L.M.E. c.i.f. Electrolytic Copper Wirebar Contract

1. *I/We* have this day *sold to/bought from* you, subject to the Rules and Regulations of the London Metal Exchange, electrolytic copper wirebars of Standard dimensions and of Brands admitted by the London Metal Exchange in the weights of 200 lb., 225 lb., 250 lb., 265 lb. or 275 lb. in Buyer's option.

2. *Quantity*, about tons of 2,240 lb. each (two per cent either more or less). Each Bill of Lading to be for about 25 tons, and to be treated as a separate Contract.

3. *Price* £..... per ton c.i.f. London, Liverpool or Manchester in Buyer's option.

4. *Specification* of the weight of Wirebar required and of the port of destination shall be given in writing by the Buyer and be received by the Seller not later than 2.30 p.m. on the fifth market day from the date of the Contract, both days inclusive.

5. *Shipment*. The Seller shall have the option to ship within a period of six weeks after the receipt of such specifications.

The brand and port of shipment may be declared by the Seller at any time after the receipt of specifications, but:

- In the case of shipment from the East Coast of the U.S.A. or the East Coast of Canada the declaration is to be made not later than the date of shipment.
- In the case of shipment from European ports the declaration is to be made not later than three days before the date of shipment; the steamer's name is to be declared immediately the copper is shipped.
- In the case of shipment from other ports the declaration is to be made not later than twelve days before the expected arrival at the port of destination.

6. *Shipping Documents* to consist of invoice, full set of Bills of Lading, and Policy or Certificate of Insurance covering Marine and Marine War Risks which shall provide for payment of claims in London. Marine and Marine War Risk Insurance to be covered for the Contract price plus 10 per cent. Any difference in insurance against the risks of war, strikes, riots and other civil commotions at the time of shipment from the rate ruling on the date of receipt of specification shall be for Buyer's account.

7. *Weights*. Bill of Lading weights to govern.

8. *Payment*. Net cash in London against presentation of documents. Documents not to be presented for payment earlier than five days before the scheduled date of arrival of steamer at port of destination, and at latest in due time to enable Buyer to take delivery in due course of ship's unloading, unless the steamer shall be posted as a total loss at Lloyds, in which case the documents shall be presented to Buyers as soon as they are available to Sellers.

Sellers shall give notice to Buyers not later than 11 a.m. when payment is required the same day.

Documents to be tendered before 2.30 p.m. on market days only.

9. *Strike Clause*. In case of Force Majeure, Strikes, Lock-outs, combinations of Workmen, or other contingencies whatsoever beyond the control of the Seller, including War, preventing the due performance of this contract, the supplies of Copper now contracted for may be suspended during the continuance thereof. Notice must be given by the Seller within the period named for shipment and passed on without delay if relief is claimed under this clause.

10. *Any Dispute* arising under this contract to be settled by arbitration in accordance with the Rules and Regulations of the London Metal Exchange.

OTHER LONDON PRICES — AUGUST 4

METALS

Aluminium, 99.5%, £171 per ton	Nickel, 99.5% (home trade) £519 per ton
Antimony—	Osmium, £24/27 oz. nom.
English (99%) delivered, 10 cwt. and over £210 per ton	Osmiridium, £40 oz. nom.
Crude (70%) £200 per ton	Palladium, £7 0s./£7 10s. oz.
Ore (60% basis) 23s. 6d./24s. 6d. nom. per unit, c.i.f.	Platinum U.K. and Empire Refined £29 oz. Imported
Bismuth (min. 1 ton lots) 16s. lb.	Rhodium, £40
Cadmium (Empire) nominal	Ruthenium, £16 oz.
Chromium, 6s. 11d./7s. 4d. lb.	Quicksilver, £108 ex-warehouse
Cobalt, 21s. lb.	Selenium, 43s. nom. per lb.
Gold, 251s. 2d.	Silver, 79½d. f.o.z. spot and 79d. f'd
Iridium, £30 oz. nom.	Tellurium, 15s./16s. lb.
Manganese Metal (96%-98%) £269 according to quantity	
Magnesium, 2s. 4d. lb.	

ORES, ALLOYS, ETC.

Bismuth	60% 8s. 3d. lb. c.i.f.
Chrome Ore—	40% 6s. 3d. lb. c.i.f.
Rhodesian Metallurgical (semi-friable) 48%	£13 per ton c.i.f.
Refractory 45%	£13 per ton c.i.f.
Small 42%	£10 2s. 6d. per ton c.i.f.
Magnesite, ground calcined ..	£26-£27 d/d
Magnesite, Raw	£10-£11 d/d
Molybdenite (85% basis) ..	105s. 3d.-108s. 1d. per unit c.i.f.
Wolfram and Scheelite (65%) ..	253s./257s. c.i.f.
Tungsten Metal Powder (98% Min. W.) ..	20s. 6d. nom. per lb. (home)
Ferro-tungsten (80%-85%) ..	17s. 6d. nom. per lb. (home)
Carbide, 4-cwt. lots	£37 6s. 3d. d/d per ton
Ferro-manganese, home ..	£53 17s. 6d. per ton
Manganese Ore Indian c.i.f. Europe (46%-48%) basis 100s. freight ..	80d./83d. per unit
Manganese Ore (38%-40%) ..	66d./68d. per unit
Brass Wire	3s. 4½d. per lb. basis
Brass Tubes, solid drawn ..	2s. 9½d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

The past week included the August Bank Holiday, the beginning of the period when markets are traditionally quiet. Prices continued their steady downward drift due to a variety of different factors. These included the Chancellor's continued squeeze on credit and the bad July balance of payments figures. These latter can partially be accounted for by the normal seasonal fluctuations, against sterling, but the dock strike and foreign speculation against the pound had a good deal to say in this matter.

In the Kaffir market, finance houses generally lost the turn but Union Corporation showed resistance due to continued rumours from Johannesburg concerning possible exploitation of the Bethel area. Johannesburg Consolidated dropped sharply as there was little improvement in the operating figures of mines in this group.

Among individual Rand mines, prices followed the general downward trend and there were few points of interest. Some of the older properties showed resistance, notably City Deep and Rose Deep. Hartebeestfontein failed to respond to the excellent initial returns. The mine showed a profit of over £57,000 in July. The results from Luipaards Vlei were also outstanding with a sharp increase in uranium profits. The company will now start to repay government loans advanced for the erection of special plant. Randfontein dropped due to the fact that there was little improvement in the working results from this property.

Prices in the Orange Free State section also declined. Freddie's were an exception due to rumours of a land deal reputed to emanate from Johannesburg. The results from Freddie's Consolidated, however, continued to be most disappointing. Harmony fell sharply, partly due to the fire at the property, but the recent quarterly report also disclosed a considerable drop in values and payability. The results from the two President mines showed continued progress and the July returns from St. Helena were also encouraging. None of these succeeded in halting the fall.

In the West African market there was little to report although the Ashanti returns disclosed better figures than for the comparable returns last year, and it seems probable that the Eaton Turner shaft has now reached its final depth.

There were a few changes in the West Australian section, but the maintenance of the dividends from Gold Mines of Kalgoorlie and the higher group profits from Western Mining tended to steady share prices.

In the miscellaneous market, Zambesis were again in favour and Mysore improved due to higher profits from the Indian property and following the share division.

Copper shares were mixed but the tone was better following the improved labour situation in Rhodesia. Chartered encountered profit-taking by small holders and lost the turn. Rio Tinto forged ahead to a new peak level in their new form, Rhodesian Selection Trust rose sharply, finishing at 46s. on Wednesday. The company has increased its fixed price of copper to £325 per ton, although this is still well below the current metal market price.

Eastern tin shares were upset by political developments in Malaya and Singapore. Resistance to the downward trend was shown by the Kinta mines and Rambutan, the latter being affected by the recent dividend announcement. British Tin Investment were also bought on the investment possibilities and some slight confidence was shown on some of the Nigerian properties.

Lead/Zinc shares fell away despite the maintenance of the metal price. San Francisco Mines, however, moved sharply against the general trend. The satisfactory position of Mount Isa, due to sales of copper was not recognised in the market price.

In the miscellaneous base metals section, a harder tendency was noticeable among some of the leading South African colliery shares. Manganese issues were also sought after and some quiet buying of Associated Manganese caused a rise in price in a rather difficult market.

Among Canadians, base metal shares hardened despite the easier tendency on Wall Street. International Nickel were favoured due to the increase of the interim dividend and Noranda were affected by better news from the copper labour front in the United States and South America.

Finance	Price Aug. 3	+ or - on week	Rand Gold contd.	Price Aug. 3	+ or - on week	Diamonds and Platinum	Price Aug. 3	+ or - on week	Tin (Nigerian and Miscellaneous) contd.	Price Aug. 3	+ or - on week
African & European	3 1/2	+	W. Rand Consolidated	43/9	-1/3	Anglo American Inv.	9 1/2	- 1/2	Gold & Base Metal	2/3	.....
Anglo American Corp.	8 1/2	.....	Western Reefs	37/6	-1/-	Castles	29/6	+9d	Java Tin Area	7/9	.....
Anglo-French	23/3	.....	O.F.S. Gold			Cons. Diam. of S.W.A.	6 1/2	- 1/2	Kaduna Prospects	2 1/2	+3d
Anglo Transvaal Consol.	26/3	.....	Freddies	6/10 1/2	+10 1/2d	De Beers Deft. Bearer	17	- 1/2	Kaduna Syndicate	2/10 1/2	+1 1/2d
Consolidated Mining (C.I. sh.)	47/6	-1/-	Freddies Consolidated	5/10 1/2	-4 1/2d	Pots Platinum	10/-	-4 1/2d	London Tin	9/9	-3d
Consolidated Goldfields	64/6	.....	F.S. Geduld	4 1/2	.....	Waterfall	10/-	-9d	United Tin	2/-	.....
Consol Mines Selection	41/10 1/2	-7 1/2d	Geoffries	15/9	-9d						
East Rand Consols.	2/13	.....	Harmony	33/-	-1/-	Copper			Silver, Lead, Zinc		
General Mining	4 1/2	- 1/2	Lorraine	9/6	-6d	Bancroft	41/6	+6d	Broken Hill South	55/7 1/2	-4 1/2d
H.E. Prop.	9/1 1/2	+1 1/2d	Lydenburg Estates	18/6	-3d	Chartered	73/3	- 1/2	Burma Mines	3/-	-1 1/2d
Johnnies	31/6	-1/3	Merriespruit	9/9	-3d	Esperanza	4/4 1/2	-11d	Consol. Zinc	56/3	-1/3
Rand Mines	3 1/2	.....	Middle Wits	15/-	-9d	Messina	9 1/2	+ 1/2	Lake George	13/3	.....
Rand Selection	43/9	-1/3	Ofatts	67/3	-1/6	Nchanga	14/6	+ 1/2	Mount Isa	60/9	-1/3
Union Corporation	48/-	.....	President Brand	71/3	-7 1/2d	Rhod. Anglo-American	5 1/2	.....	New Broken Hill	43/3	-3d
Vereeniging Estates	41/10 1/2	-7 1/2d	President Steyn	38/6	-1/3	Rhod. Katanga	23/6	+1/-	North Broken Hill	78/9	.....
Wits	38/6	-1/3	St. Helena	30/3	-6d	Rhodesian Selection	42/6	+1/-	Rhodesian Broken Hill	14/-	-7 1/2d
West Wits	38/6	-1/3	Virginia Ord.	13/3	-3d	Rhokana	43 1/2	+1 1/2	San Francisco Mines	24/6	+1/6
			Welkom	20/3	-6d	Rio Tinto	4	+ 1/2	Uruwira	7/7 1/2	+1 1/2d
			Western Holdings	3 1/2	- 1/2	Roan Antelope	27/6	-3d			
Rand Gold						Selection Trust	48	.....	Miscellaneous		
Blyvoors	27/9	-6d	West African Gold			Tanks	8 1/2	.....	Base Metals and Coal		
Brakpan	6/9	-4 1/2d	Amalgamated Banket	2/3	.....	Thariss Sulphur Br.	6 1/2	- 1/2			
Buffelsfontein	38/6	-3d	Ariston	6/3	-1 1/2d				Amal. Colleries of S.A.	50/-	+1/-
City Deep	12/3	-3d	Ashanti	23/7 1/2	-1 1/2d	Tin (Eastern)			Associated Manganese	34/-	+2/6
Consol. Main Reef	21/10 1/2	.....	Bibiani	4/6	-1 1/2d	Ayer Hitam	33/3	-1 1/2d	Cape Asbestos	11/-	-1 1/2d
Crown	2	- 1/2	Bremang	1/6	.....	Gopeng	10/-	-1/3	C.P. Manganese	37/-	+1/-
Daggas	2 1/2	.....	G.C. Main Reef	3/1 1/2	-1 1/2d	Hongkong	8/6	-3d	Consol. Murchison	53/9	-1/10 1/2d
Dominion Reefs	14/6	-9d	Konongo	3/-	.....	Ipooh	23/9	-3d	Coal Navigation	.....	.....
Dornfontein	27/6	-9d	Lyndhurst Deep	1/6	.....	Kamunting	9/-	-4 1/2d	Turner & Newall	113/9	.....
Durban Deep	30/7 1/2	-3d	Marlu	2/3	.....	Kepong Dredging	3/9	.....	Wankie	18/3	-4 1/2d
E. Champs.	6/-	.....	Taqaah	1/6	.....	Kinta Tin Mines	15/6	+6d	Witbank Colliery	4 1/2	+ 1/2
E. Daggas	10/-	.....	Western Selection	9/9	-1 1/2d	Malayan Dredging	10/3	-7 1/2d			
E. Geduld (4s. units)	30/6	.....				Pahang	14/3	-4 1/2d	Canadian Mines		
E. Rand Props.	3	.....	Australian Gold			Pengaklen	13/3	-3d	Dome	530	.....
Geduld	4 1/2	- 1/2	Gold Mines of Kalgoorlie	14/-	-3d	Petaling	11/3	-7 1/2d	Hollinger	519	+2
Govt. Areas	6/6	-6d	Grant Reider Prop.	10/10 1/2	.....	Rambutani	8/3	-4 1/2d	Hudson Bay Mining	541/-	+2
Grootevlei	21/-	-3d	Lake View & Star	18/6	+1 1/2d	Siamese Kinta	8/9	-4 1/2d	International Nickel	5143	.....
Hartebeestfontein	40/3	-6d	Mount Morgan	21/9	.....	Southern Kinta	20/-	-9d	Mining Corp. of Canada	184	.....
Ibanon	8/4	-6d	North Kalgurlu	6/10 1/2	.....	S. Malayan	8/6	-4 1/2d	Noranda	106 1/2	+2
Lupaards Vlei	20/9	.....	Sons of Gwalia	4/6	.....	S. Tronoh	9/3	-1 1/2d	Quemont	£9 1/2	.....
Marievale	20/6	.....	Western Mining	9/6	- 1/2	Sungei Kinta	14/3	-3d	Yukon	4/4 1/2	-1 1/2d
New Kleinfontein	7/3	-9d	Miscellaneous Gold			Tekka Taiping	8/3	-6d			
New Pioneer	14/-	-2/-				Tronoh	9/-	-7 1/2d	Oil		
Randfontein	57/-	-2/-							British Petroleum	6 1/2	- 1/2
Robinson Deep	16/9	-3d							Apex	35/6	+6d
Ross Deep	10/6	.....							Attcock	46/3	-2/3
Simmer & Jack	4/-	.....							Burmah	8 1/2	- 1/2
S.A. Lands	22/6	-7 1/2d							Canadian Eagle	23/6	-9d
Springs	2/6	.....							Shell	7 1/2	.....
Stifffontein	26/6	-3d							Trinidad Leasehold	40/6	-1/3
Sub Nigel	35/7 1/2	-1/3							T.P.D.	26/3	+3d
Vaa. Reefs	34/-	-2/6							Ultramar	31/6	- 1/2
Van Dyk	17/6	-9d									
Ventersdorp	13/6	-9d									
Vlakfontein	17/6	-9d									
Vogelstruisbult	31/-	-9d									
Wegfontein	5 1/2	- 1/2									

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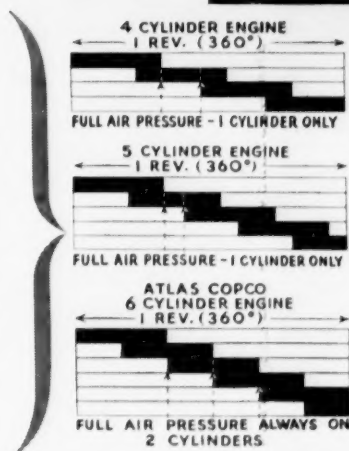
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COMPANY NEWS AND VIEWS

Rand and O.F.S. Returns For July

During the month of July profit figures in respect of Rand and O.F.S. producing mines were based on a gold price of 251s. 3d. per oz. as compared with 250s. 7d. in June. The higher price resulted from sustained pressure on sterling due to fears that a lower exchange level might follow the possible introduction of a partial form of convertibility by the sterling area. Since that time, the Chancellor of the Exchequer, Mr. Butler, has done a good deal to dispel such fears, although many currency market operators still believe that convertibility will ultimately—if only temporarily—bring about a fall from the present artificially supported level of sterling in terms of the U.S. Dollar.

From the point of view of South African gold mining profits such an occurrence would mean substantial benefits. The notable feature of the returns was the initial profits of £57,583 earned by Hartbeesfontein Gold Mining Company situated in the Klerksdorp area of the Far Western Rand. This outstanding result was achieved by milling the large initial tonnage of 44,000 tons from which 14,750 oz. of gold were produced representing a mill grade of about 6.7 dwt. per ton. Costs at 59s. 9d., although on the high side, should soon decrease as operations get into their stride. Initially 50,000 tons of ore will be milled a month and the fact that this target should have been so nearly reached during the first month's operation gives a very good idea of the favourable underground and technical condition at the mine.

On the other hand the present market price for the company's 10s. shares standing at about 40s. discounts the belief that the property will ultimately become a 10 dwt. proposition. Yet so far, development results obtained since the most encouraging initial opening up operations have shown a tendency to fall away. Much attention will in future months, therefore, centre around values disclosed.

President Brand, once again achieved a rise in the grade of ore milled. This time the advance was modest and represented 25 dwt. bringing the total recovery to 15.75 dwt. per ton. This mine's position as the richest gold property in South Africa has thus been maintained and compares with West Driefontein—the second best—which reported a mill grade of 15.3 dwt. per ton during July. But this is not the whole story for President Brand's ore reserves of 905,000 tons with a value of 21.3 dwt. per ton compares with West Drie's 1,096,000 tons with the lower value of 16.5 dwt. per ton. Good progress was made by President Stein and tonnage crushed rose by 2,000 tons. There was a fractional improvement in the mill grade to 7 dwt. per ton while costs fell by 8d. and profits rose by more than £9,000. Welkom also reported a rise in mill grade to 3.9 dwt. from about 3.8 dwt. and though there was a drop of 2,500 tons in the crushing rate, profits rose by some £2,500.

The new producer, Lorraine, again reported a loss despite a rise in tonnage milled. Further progress was made by St. Helena whose grade rose from 5.4 dwt. to 5.5 dwt. bringing added profits of about £7,500 over those of the previous month.

The results of the recent fire at Harmony have been reflected in the July production figures by a fall of 4,000 tons in mill throughput. Grade, however, was maintained at 7.2 dwt. per ton but profits declined by some £8,000. The somewhat improved development results disclosed by Freddie's Consolidated in respect of the past quarter ended June 30 have not yet been reflected in the monthly return. And although tonnage crushed rose by 1,000 tons at this property and costs declined, the total loss incurred was very little different from that of the previous month.

Our usual table of statistics will be published next week.

Trial Runs Started at Dominion Reefs Uranium Plant

The quarterly report for three months ended June 30, 1955, issued by Dominion Reefs (Klerksdorp) states that the uranium plant was completed in June and trial runs started. The plant is in production and operating satisfactorily, the report continues. While uranium results will be published at the end of each quarter, consideration is to be given in due course to the advisability of publishing monthly figures.

International Nickel Pay 10 Cents More

The International Nickel Company of Canada has raised its third quarter's dividend for 1955 by 10 cents to 65 cents. This brings the year's distribution so far to \$1.75. During the year

ended December 31, 1954, a quarterly rate of 50 cents was maintained until December at which time an additional distribution of 90 cents was made. This brought total dividends to \$2.90 as compared with \$2.35 for the preceding 12 months.

Consolidated Tin Earns Less Pays Same

As previously forecast by Mr. Clifford Waite, revenue from sales of slag by Consolidated Tin Smelters during the year ended March 31, 1955, did not equal that of the previous year due to the termination of a contract for this product. This factor had a substantial bearing on the reduced profits earned.

Year to Mar. 31	Group Profit*	Taxation	Net† Profit	Dividends	To Reserve	Carry Forward
	£	£	£	£	£	£
1955	1,187,817	582,244	489,581	221,959	50,000	1,281,512
1954	1,517,811	828,530	599,865	213,363	100,000	984,119

* Including Investment income of £137,144 (1954 - £99,123).

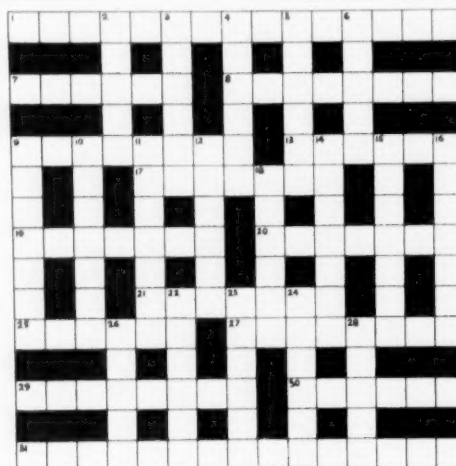
† Excluding miscellaneous credits of £131,809 (1954 - £15,736).

A dividend of 15 per cent was again paid on the issued ordinary capital of £1,998,470 in shares of £1.

Meeting, London, August 18.

Capital Re-organization by E.R.C.

The full report and accounts of East Rand Consolidated for the year ended December 31, 1954, has disclosed details of a re-organization proposal designed to reduce the company's capital to £600,000 in 2s. stock units from £1,500,000 in stock units of 5s. Accordingly, certain assets have been written off in the parent company's accounts thereby increasing the adverse balance to £1,123,501. The proposed writing down of capital together with the utilization of share premiums amounting to £223,501 will eliminate this balance.



'UNICONE' CROSSWORD No. 8

ACROSS.—1. 8. 12; 32; 44 (9, 2, 4). 7. A penny for your thoughts about this one (6). 8. Drugging aspect of a cane file (8). 9. Not specified whether the flowers are Indian or China (8). 13. Rum aid for X-ray treatment (6). 17. North and South of the Tyne (7). 19. Bring to light perhaps the contents of the first part of 20 (7). 20. Most serious little street (7). 21. The camel swallows an artist for a sweet (7). 25. Was the wrapping? (6). 27. Right skilful (8). 29. Up on the hind legs for this gait (8). 30. Decree (6). 31. Hall mark of the craven (3, 6, 6).

DOWN.—2. Does the beast get 'thin at one end' (5). 3. To lose vitality (6). 4. Make it a good one and you might get off (6). 5. Various degrees here (6). 6. The sapper has dug himself into a meal it seems and escaped (5). 9. U.

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Solution on page 166

During the past financial year total revenue shown in the consolidated profit and loss account rose to £48,262 from £45,394. After a loss on mining operations of £2,229 (£10,252) together with expenses, the balance carried down was increased to £35,110 from £25,013 during the previous year. An amount of £310,426 (£24,959) was then written off and allowance made for provisions of £65,825 (£5,415). The adverse balance carried forward accordingly increased to £1,127,932 from £788,493 previously.

Apart from its Far Eastern Rand interests mainly represented by holdings in Spaarwater and Witwatersrand Nigel gold mining companies E.R.C. has a sizeable investment portfolio which includes a good number of O.F.S. shares. The market valuation of quoted investments at December 31, 1954, was £639,959 compared with £493,054 in the preceding year. Major-General W. W. Richards is chairman. Meeting, London, September 13.

Decrease in S.W. Africa's 1954-55 Profits Expected

A statement from the S.W. Africa Company has disclosed that—on present indications—the profit for the year 1954-55 will not reach the figure shown in the previous year's accounts.

The report also states that the possibility of providing working capital for expenditure now being incurred on development and plant at Abenab West and Brandberg West properties is still under consideration. Further action on this matter has, however, been deferred pending the result of an application to H.M. Treasury for permission to transfer the control and management of the company to South West Africa.

Careful consideration has been given to the question of making an interim distribution but the conclusion has been reached that it is better to pay one dividend only. This has been the case for most previous years. Having regard to existing circumstances at that time, this will take place after about three months.

Operations during the quarter ended June 30, 1955, at the Abenab West Mine resulted in the production of 987 tons of lead and 331 tons of vanadium pentoxide. This compares with 1,094 tons of lead and 276 tons of vanadium pentoxide during the preceding quarter. Output from Brandberg West Mine during the same period was 51.6 tons of tin and 21.8 tons of tungstic oxide as compared with 42.4 tons of tin and 26.8 tons of tungstic oxide.

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MAJOR W. E. HOSKING'S REVIEW

The Twenty-eighth annual general meeting of Kent (F.M.S.) Tin Dredging, Ltd., was held on July 27 at the Registered Office, Redruth.

Major W. E. Hosking (Chairman) presided.

The Reports and Accounts for the year ended December 31, 1954, having been circulated for the prescribed time, were taken as read, as was also the Chairman's Statement, circulated with the Reports and Accounts, which was as follows:—

The Accounts for the financial year ended December 31, 1954, submitted herewith, show a gross profit of £18,986 after payment to the Malayan Government of £28,086 as Royalty on ore sales and provision of £33,916 for United Kingdom and Malayan Taxation.

After payment of the second Interim Dividend and before the accounts were closed, agreement was obtained with the Income Tax Authorities of the Company's taxation liabilities including matters in connection with the Company's War Damage Claims. As a result of the reduction in taxation liability the sum of £15,836—previously provided and no longer required, and now shown in the Profit and Loss Appropriation Account as a credit—became available and justified your Directors in paying a third Interim Dividend.

From the available balance £1,586 was written off from Capital Expenditure (Plant and Equipment), £10,000 off Leases and Mining Rights, and Shareholders received three Dividends totalling 9 3/5 pence per share, absorbing a net amount of £23,494. The Directors propose that the balance standing to the credit of Profit and Loss Account, decreased from £33,608 to £33,350, be carried forward to the current year.

The Annual Report of our General Managers, Messrs. Osborne and Chappel circulated with the Reports and Accounts gives comparative statistics and a summary of conditions at the Mine.

The volume of ground dredged was approximately 20,000 cu. yds. less than in the previous financial year and the tonnage of tin-ore produced was 359.28 tons as compared with 414.70 tons, due mainly to a reduction from 0.44 kati to 0.38 kati in the grade of ground treated.

The average price received for tin ore was £413 per ton, a decrease of £14 per ton on the previous year's figure.

Since the close of the year under review, Shareholders have been notified that the output for the first three months of the current year was 71½ tons. The General Managers in their report state that a somewhat reduced output is expected due to the lower average value of the ground and the higher proportion of clay known to be present.

The International Tin Agreement, negotiated at the close of 1953, received the required number of Member Governments' signatures, but it still requires ratification by some of the Governments concerned before it can be brought into operation.

The security position has, on the whole, continued to improve and I am pleased to state that there were again no incidents at the property during the year. In some districts, however, there has been little improvement and there is no room for complacency or slackening of effort.

Your Directors have pleasure in placing on record their appreciation of the services rendered by the General Managers, Resident Manager, the Staff and labour force at the mine during the year under review.

The Statement of Accounts and Balance Sheet, together with the Directors' Report, were received and adopted.

Mining Men and Matters

The death has been announced of **Mr. George Oldham** one of the three joint managing directors of Oldham and Son Ltd. Mr. Oldham, a grandson of the founder of the firm, was 68 years of age and joined the family Company in 1905. During his lifetime he had been actively concerned with all the developments of the firm and as a young engineer he specialized in the Company's mining activities and was intimately connected with the production of the well known Oldham Miners' electric lamps.

Annual Review Correction—East Africa. The 1955 *Mining Journal Annual Review* in the article dealing with East Africa (page 149) it was stated that gold production in Uganda for 1952, 1953 and 1954 was nil, 5,529 oz. and 5,700 oz. respectively. These figures are incorrect; the correct figures being as follows: 1952, 162 oz.; 1953, 522.20 oz.; and 1954, 590.55 oz.

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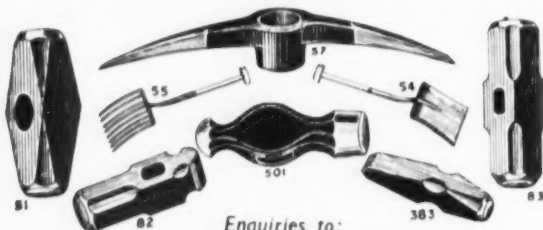


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CORRECT SOLUTION TO "UNICONE" CROSS-WORD No. 8 APPEARING ON PAGE 164

ACROSS: 1, Multiples of Four; 7, Copper; 8, Caffeine; 9, Tearoses; 13, Radium; 17, Shields; 19, Unearth; 20, Gravest; 21, Caramel; 25, Swathe; 27, Dextrous; 29, Prancing; 30, Ordain; 31, The yellow streak.

DOWN: 2, Tapir; 3, Perish; 4, Excuse; 5, Oxford; 6, Freed; 9, Tenuous; 10, Antenna; 11, Ostrich; 12, Either; 14, Assault; 15, Inferno; 16, Mentors; 18, Legume; 22, Aerial; 23, Adagio; 24, Extols; 26, Tansy; 28, Rider.

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